REMARKS

In the Office Action dated December 16, 2008, the Examiner rejects claims 1-6, 8, 10 and 11 under 35 U.S.C. § 102(b) as being anticipated by Munshi. The Examiner rejects claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Munshi as applied to the claims and further in view of Hwang et al., claim 9 under 35 U.S.C. § 103(a) as being unpatentable over Munshi in view of Usui et al., and claims 12-20 under 35 U.S.C. § 103(a) as being unpatentable over Munshi in view of Hopkins et al. With this Amendment, claims 1, 3, 4, 10 and 12 are amended, and claim 2 has been canceled without prejudice. Claim 21 is new. After entry of this Amendment, claims 1 and 3-21 are pending in the Application.

Applicants take notice of the double patenting rejections and wish to address this when allowable claims have been determined.

Support for new claim 21 is found in the specification at paragraph [0029].

Applicants traverse the Examiner's rejections. Applicants are herewith submitting as Exhibit 1 a Declaration of Dr. Shigeo Ibuka (hereinafter Decl.) in support of its position. Dr. Ibuka is employed by Nissan Motor Co., Ltd. in the position of engineer in its Next Generation Battery Development Group. He has a doctorate in electrical chemistry and has two years of experience with lithium ion batteries, including those made with bipolar electrodes. (Decl., ¶¶ 1,2). He bases his facts and opinions on a review of the Examiner's Office Action dated December 16, 2008 and the cited references. (Decl., ¶ 3).

Rejections under 35 U.S.C. §102(b)

Claims 1-6, 8, 10 and 11 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Munshi. Independent claims 1 and 10 have been amended to include the limitations of dependent claim 2, which has been canceled. Claims 1 and 10 are also amended to clarify that there is no additional layer between the high-polymer material of the collector and the cathode and anode respectively. Claims 1 and 10 as amended recite a bipolar electrode stack comprising a collector, a cathode electrically connected to a first side of the collector, an anode electrically connected to a second side of the collector, and one or more electrolyte layers

overlaying the cathode and anode, wherein the collector comprises a high-polymer material containing a plurality of electrically conductive particles. The cathode and anode directly contact at least a portion of the high-polymer material of the collector.

The Examiner contends that Munshi teaches or suggests each and every element of Applicants' claims 1 and 10. However, Munshi does not teach a collector comprised of a high-polymer material, as low-polymer material is disclosed in Munshi. As the Examiner has accurately listed on page 2 of the Office Action, Munshi discloses the use of a collector formed of PET(polyester), PP, PEN, PE, PVDF, PC, PPS and PTFE only.

Munshi also does not disclose an anode and a cathode in direct contact with at least a portion of the high-polymer material of the collector. In the first exemplary battery described in Munshi, the collector is an aluminum coated polymer. The aluminum layer ranges in thickness as shown in Table 1 of Example 4. Examples 1-3 do not discuss a collector. In Example 5 of Munshi, a double-metalized substrate is disclosed comprising a polymer substrate 12 and metallization layers 16a and 16b in Fig. 1C. Another alternative is to laminate anode and cathode active elements on opposite sides of a double-metalized substrate as described, with the substrate further impregnated with electronically conductive material, as shown in Fig. 3. (Col. 26, ll. 5-15). The thickness of the metallization layer on the polymer layer of the substrate is selected according to the desired conductivity of the layer. (Col. 27, ll. 52-55). Example 6 uses a metal foil collector. (Col. 28, line 3). (Decl., ¶8). Therefore, the anode and cathode contact the metal layer or metal foil of the collector of Munshi.

Because Munshi fails to teach a collector comprising a high-polymer material with the anode and cathode in direct contact with at least a portion of the high-polymer material of the collector as recited by Applicants in independent claims 1 and 10, Munshi does not teach, suggest or anticipate claims 1 and 10. Applicants respectfully submit that claims 1 and 10 are in condition for allowance, notice of which is requested.

Claim 4 has been amended to recite that the high-polymer comprises one or more of polyethylene terephthalate, polyimide, and polyamide. As noted by the Examiner on page 2 of the Office Action, Munshi discloses the use of a collector formed of PET(polyester), PP, PEN,

PE, PVDF, PC, PPS and PTFE only. In addition, claim 4 depends from claim 1 to include all of the limitations therein. Therefore Munshi does not anticipate claim 4.

Claim 2 has been canceled. Claim 3 has been amended to depend from claim 1. Claims 3, 5, 6, 8, 11 and new claim 21 depend either from claim 1 or claim 10 directly or indirectly to include all of the limitations therein. By this dependency, Munshi does not teach, suggest or anticipate the invention recited in claims 3, 5, 6, 8, 11 and new claim 21. Applicants respectfully submit that claims 3, 5, 6, 8, 11 and new claim 21 are in condition for allowance, notice of which is requested.

Rejections under 35 U.S.C. §103(a)

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Munshi as applied to claims 1-6, 8, 10 and 11 and further in view of Hwang et al.

To fulfill the long-felt need of thinner and lighter batteries, Applicants found a way to reduce the weight of the claimed battery by eliminating the need for a metal layer on the surface of the collector. The claimed collector is made of a high-polymer material containing a plurality of electrically conductive particles. It was unexpectedly discovered that the use of high-polymer material, in particular polyethylene terephthalate, polyimide and polyamide, prevents the volatilization and migration of the electrolyte similar to a metal layer. This phenomenon is illustrated in the graph appended to the Declaration, illustrating the weight of the electrolyte over time when used with collectors of different polymers. Polyimide, polyethylene terephthalate and polyamide are graphed against polypropylene from three different manufacturers. In addition, the combination of the electrically conductive particles in the polymer collector and no metal layers on the outside of the collector allows for the electrical current to pass vertically rather than along the collector surface. The collector can be made very thin and does not require an outer metal layer, thereby reducing the weight and thickness of the battery. (¶[0025], Decl., ¶ 7).

As discussed above, Munshi does not teach these capabilities because Munshi does not teach or suggest a collector comprising a high-polymer material with the anode and cathode in direct contact with at least a portion of the high-polymer material of the collector. The

polymer is used in the collector of Munshi because it renders the collector very flexible for ease of coating and handling. (Col. 22, ll. 63-65; Decl., ¶8).

Hwang et al., like the Applicants, are trying to reduce the weight of the battery by making a lighter collector. (¶[0011]). Hwang et al. reduces the weight of conventional collectors, disclosing a collector including a polymer film with a metal deposited on the polymer film. (¶[0012]). The metal deposited on the polymer film has a specific thickness. If it is too thin, it cannot completely cover the surface of the polymer film. (¶[0019]). Because the metal can be provided in a thinner layer than can be used with conventional collectors, it is lighter than conventional collectors. (¶[0020]). Although Hwang et al. discloses the use of higher molecular weight polymers, Hwang et al. obviously does not realize the unexpected result of eliminating migration of electrolytes, as the polymer is covered with the coating of metal. (Decl.. ¶11).

There is no teaching in the combination of Munshi and Hwang et al. that would lead one skilled in the art to make a collector of any kind without the thinnest of metal layers on its surface, no matter what polymer is used. (Decl., ¶12).

For these reasons, Applicants respectfully submit that neither claim 7, nor amended independent claims 1 and 10, is rendered obvious by the combination of Munshi and Hwang et al.

Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Munshi in view of Usui et al. Claim 9 depends from claim 1 to include all of the limitations therein. As discussed above, Munshi does not teach or suggest a collector comprising a high-polymer material with the anode and cathode in direct contact with at least a portion of the high-polymer material of the collector. Usui et al. in combination with Munshi would not render obvious to one skilled in the art to utilize the high-polymer material without a metal layer. Because Usui et al. in combination with Munshi does not teach, suggest or render obvious claim 1, the combination also does not teach, suggest or render obvious claim 9 due to this dependency.

Claims 12-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over

Munshi in view of Hopkins et al. Amended independent claim 12 recites a method for manufacturing a bipolar electrode assembly comprising applying a high-polymer material to a collector surface comprising a plurality of electrically conductive particles using an inkjet printing method to form a collector; applying a cathode material layer to a first side of the high-polymer material of the collector; applying an anode material layer to a second side of the high-polymer material of the collector; applying a first electrolyte layer overlaying the cathode material layer; and applying a second electrolyte layer overlaying the anode material layer.

As discussed above, Munshi does not teach or suggest a collector comprising a high-polymer material with the anode and cathode material applied to opposite sides of the high-polymer material collector. As noted by the Examiner on page 5 of the Office Action, Munshi teaches a flexible first polymer substrate, optionally including an electrically conductive material, with two opposite sides, two opposite edges and two metallization layers coating each side of the substrate.

Hopkins does not teach or suggest using an inkjet printing method to form a collector. Hopkins only discloses using an inkjet printer for forming electrodes on a collection. In addition, combining Hopkins with Munshi does not teach, suggest or render obvious the high-polymer material with the anode and cathode material applied to opposite sides of the high-polymer material collector deficient in Munshi. Therefore, claim 12 is not rendered obvious by the cited combination.

Claims 13-20 depend from claim 12 to include all of the limitations therein. For at least this dependency, claims 13-20 are not taught, suggested or rendered obvious by the combination of Munshi and Hopkins. Applicants respectfully submit that claims 12-20 are in condition for allowance, notice of which is requested.

Conclusion

Applicants respectfully submit that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Reconsideration of the

application as amended is requested. It is respectfully submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

YOUNG BASILE HANLON MACFARLANE & HELMHOLDT, P.C.

/Francine Nesti/

Francine B. Nesti
Registration No. 53376
(248) 649-3333

3001 West Big Beaver Rd., Ste. 624
Troy, Michigan 48084-3107